PAVEMENT SURFACE CONDITION ATTRIBUTED TO TRAFFIC OPERATIONS ON FEDERAL ROADWAYS IN KUANTAN

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STUDENT'S DECLARATION

I hereby declare that the work in this thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at Universiti Malaysia Pahang or any other institutions.

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ABSTRAK

Kerosakan turapan jalan sentiasa dikaitkan dengan fungsi optimumnya dan mungkin menyumbang kepada kemalangan jalan raya. Sebilangan besar wang terus dibelanjakan untuk penyelenggaraan jalan raya kerana kerosakan turapan ini. Terdapat beberapa faktor yang mempengaruhi kerosakan turapan seperti perubahan cuaca, kualiti bahan dalam pembinaan, penyelenggaraan yang tidak wajar dan operasi trafik. Kajian ini dijalankan untuk meneroka kerosakan turapan faktor penyumbang berdasarkan operasi lalu lintas. Dari segi pemuatan lalu lintas dan jumlah lalu lintas sebagai pusat analisis kritis. Untuk mencapai matlamat ini, data diperoleh dari RoadCare dan JKR dengan menggunakan data sekunder dan taburan kuesioner. Terdapat tiga Laluan Persekutuan yang dipilih di Kuantan sebagai lokasi kajian yang merupakan Laluan Persekutuan 2, Jalan Persekutuan 3 dan Laluan Persekutuan 183. Untuk mencapai matlamat pertama kajian ini, statistik deskriptif telah digunakan. Daripada analisis data, kerosakan turapan corak yang paling biasa berlaku adalah berlubang berdasarkan data analisis. Bagi objektif kedua, data dianalisis dengan menggunakan statistik kesimpulan. Dari hasilnya, elemen pertama menunjukkan terdapat korelasi positif tetapi tidak signifikan antara volum lalu lintas dan kerosakan turapan dengan nilai tertinggi r ialah 0.987 pada FR3 dengan p-value 0.101 yang lebih daripada 0.05 dan tidak dapat diterima. Bagi elemen kedua, hasil menunjukkan hubungan positif dan signifikan antara beban lalu lintas dan kerosakan turapan untuk FR 183 dengan nilai r adalah 1.0 bermakna sangat positif dan nilai p paling rendah dengan 0.00. Hasilnya menunjukkan bahawa operasi lalulintas mempengaruhi kerosakan turapan tetapi tidak pasti kerana faktor lain seperti hujan lebat melemahkan struktur jalan dan kualiti bahan yang digunakan dalam pembinaan.

ABSTRACT

Pavement damages are always associated with its optimum function and may contribute to road crashes. A huge amount of money continuously spent on road maintenance due to this pavement damages. There are several factors that influenced the pavement damages such as weather changes, quality of material in construction, improper maintenance and traffic operations. This study was conducted to explore the pavement damage contribute factors based on traffic operations. In terms of traffic loading and traffic volume as a centre for critical analysis. To achieve this study, the data was obtained from RoadCare and JKR by using secondary data and questionnaire distribution. There were three selected Federal Route (FR) in Kuantan as the study location which are Federal Route 2, Federal Route 3 and Federal Route 183. To achieve the first objective of this study, descriptive statistic was used. From the data analyses, the most common pattern pavement damages occurred was potholes based on the data analyses. As for the second objective, the data was analyzed by using inferential statistics. From the result, the first element shows there is positive correlation but not significant between traffic volume and pavement damages with the highest value r is 0.987 on the FR3 with a p-value of 0.101 which is more than 0.05 and not acceptable. For the second element the result shows the positive relationship and significant between traffic loading and pavement damages for FR 183 with the r value is 1.0 means strongly positive and the lowest p-value with 0.00. The result shows that traffic operations influences to pavement damages but not certainly significant because of others factors such as heavy rainfall weakens road structure and low quality in materials used in construction

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LIST OF SYMBOLS

FR	Federal Roadways
PWD	Public Work Department
RTVM	Road Traffic Volume Malaysia
FR 2	Federal Route 2
FR 3	Federal Route 3
FR 183	Federal Route 183

LIST OF ABBREVIATIONS

PWD	Public Work Department
RTVM	Road Traffic Volume Malaysia
FR 2	Federal Route 2
FR 3	Federal Route 3
FR 183	Federal Route 183

CHAPTER 1

INTRODUCTION

1.0 Background

Malaysian country uses Federal Roadways (FR) as their road network for users since 21" century will desire a more stable transport system where they can be confident of arriving at their destination on schedule (Lida, 1999). All the Federal Roadways in Malaysia are under the purview of Ministry of Works (MOW). MOW have responsible to plan, build and maintain all Federal Route according to Minister's Function Act 1969. However, most of the Federal roadways project was built and maintained by the Malaysian Public Works Department (PWD) which are also one of the implementing agency under the MOW excepting Sabah and Sarawak, where by PWD in these two states were under respective state government. In Kuantan, PWD was responsible to build and maintained the Federal Roadways to give the great service of road network for their users. Then, for the selected area PWD assigning the private company such as Road Care to do the maintenance work for Federal Roadways in Kuantan City.

Road network analysis was generally based on mean values, using static traffic assignment techniques, such as travel time, travel distance or level of congestion. In traffic

assignment, traffic demand between origin and destinations is generally assume as constant, although actual traffic demand changes from time to time (Lida, 1999). Therefore, the worse pavement condition will interrupt their user trip and give the bad effect to their user such as traffic congestion and crashes. The worse pavement condition can be classifying as a pavement damages such as in pattern of potholes, rutting and cracking. All this damages may interrupt the efficiency of transportation by user for their traveler's activities. There are many reason will be considered influencing to road damages such as traffic volume and traffic loading in terms of traffic operations due to our modern technology nowadays. The traffic loading from the heavy vehicle load on the pavement subjects it to high stresses causing damages. However, not all tracks have the same harmful effects, the damage to the road pavement depends on wheel loads, number and location of axles, load distributions, 2 number of wheels, tire types, inflation pressure and other factors (Gillespie T.D., 1993). Heavy truckloads are the major cause of pavement damage. The size and configuration of vehicular loads together with the environment have an important impact on induced tensile stresses within flexible pavement (Yu H.T., 1998). This research is to identify the most common pattern pavement damages occur on Federal Roadways in Kuantan and evaluate the association between traffic operations towards pavement damages on Federal Roadways Kuantan.

1.2 Problem Statement

Roads are provided for the benefit to the road user, they also play a significant role in promoting economic growth and the living standards of the population (CSIR, 1997). With the increased growth nowadays, roads being the most important thing for social economics in order

to provide accessing to employment, social, health and education services with the nation grow and develop such as Kuantan City.

There were many roadways in Kuantan facing the high traffic volume traffic loading but for this study only three selected areas had been considered which were Federal Route 2 (Gambang to Kuantan), Federal Route 3 (Bypass East Bound) and Federal Route 183 (Tanjung Lumpur to Penor) because of the strategic area for daily uses and commercial vehicles accessing their travellers. All these Federal Roadways was developing as near to East Cost of Peninsular Malaysia and being the most famous roadway in Kuantan City. However, with the increased growth nowadays this area always facing the worse situation like traffic congestion and crashes because of the bad condition of pavement surface. The increasing vehicular road traffic year-on-year (Road Transport Department, 2011). Malaysia Federal roads are not well maintained and exhibit much surface damages, which causes difficulties for road users (Nizam, 2009) and means their overall performance is below that of highways and expressways (Mansor, 2010). Therefore, good road conditions must be maintained to encourage road safety, road damages not only lead to accidents but is also costly in terms of cyclic and responsive maintenance (Hashim and Rahim,2009).

In this study the problem had been evaluated influencing the pavement damages was traffic operations in terms of traffic volume and traffic loading. The evaluation would provide according to the data collection for three years within 2014 to 2016 of pavement damages on this selected route. Thus, there was no any research focusing on actions to sustain the pavement surface. Damage can be result from poor technical design, poor standards of construction, overloaded vehicles and poor subgrade (Abas, 2011). The pavement deterioration over time is caused by a combination of factors however, traffic loads play a key role in consumption of

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